CLAIMS

1. A user interface for output on a visual display device, the user interface providing information in connection with Doppler ultrasound monitoring of blood flow, comprising:

a first graphical display indicating a plurality of locations along an ultrasound beam axis at which blood flow is detected and including a location indicator identifying a selected one of the locations; and

a second graphical display indicating velocities of monitored blood flow at the selected location.

2. The user interface of claim 1 wherein the plurality of locations is a first plurality and wherein the graphical display indicates a second plurality of locations along the ultrasound beam axis at which blood flow is not detected.

3. The user interface of claim 1 wherein the first graphical display includes first and second colors associated with blood flow in first and second directions, respectively.

4. The user interface of claim 1 wherein the first graphical display includes a color region corresponding with the locations at which blood flow is detected.

5. The user interface of claim 1 wherein the first graphical display includes a color region corresponding with the locations at which blood flow is detected, the color having varying intensity as a function of a detected Doppler ultrasound signal amplitude.

6. The user interface of claim 1 wherein the first graphical display includes a color region corresponding with the locations at which blood flow is

detected, the color associated with detected blood flow direction and having varying intensity as a function of a detected Doppler ultrasound signal amplitude.

7. The user interface of claim 1 wherein the first graphical display includes a color region corresponding with the locations at which blood flow is detected, the color associated with detected blood flow direction and having varying intensity as a function of detected blood flow velocities.

8. The user interface of claim 1 wherein the second graphical display is a spectrogram indicating the velocities of the monitored blood flow at the selected location as a function of time.

9. The user interface of claim 1 wherein the first graphical display includes a color region corresponding with the locations at which blood flow is detected, the location indicator being a pointer directed towards a position within the color region, and wherein the second graphical display is a spectrogram indicating the velocities of the monitored blood flow at the selected location as a function of time.

10. The user interface of claim 1 wherein the first graphical display indicates the plurality of locations at which blood flow is detected as a function of time.

11. The user interface of claim 1 wherein the first and second graphical displays are provided simultaneously.

12. A graphical display for providing information in connection with Doppler ultrasound monitoring of blood flow, comprising:

a blood locator display depicting a plurality of locations along an ultrasound beam axis at which blood flow is detected; and

a spectrogram depicting detected blood flow velocities as a function of time at a selected one of the locations.

13. The graphical display of claim 12, further comprising a location indicator identifying the selected location.

14. The graphical display of claim 13 wherein the location indicator is a pointer directed to the selected location depicted in the blood locator display.

15. The graphical display of claim 12 wherein the blood locator display includes a color region corresponding to the depicted locations at which blood flow is detected, the color having varying intensity as a function of a detected Doppler ultrasound signal amplitude.

16. The graphical display of claim 12 wherein the blood locator display includes a color region corresponding to the depicted locations at which blood flow is detected, the color associated with blood flow direction and having varying intensity as a function of a detected Doppler ultrasound signal amplitude.

17. The graphical display of claim 12 wherein the blood locator display includes a color region corresponding to the depicted locations at which blood flow is detected, the color associated with blood flow direction and having varying intensity as a function of a detected blood flow velocities.

18. A graphical display for providing information in connection with Doppler ultrasound monitoring of blood flow, comprising:

a blood locator display having a color region depicting a plurality of locations along an ultrasound beam axis at which blood flow is detected, and including a location indicator identifying a selected one of the locations; and

a spectrogram depicting detected blood flow velocities as a function of time at the selected location.

19. The graphical display of claim 18 wherein the location indicator is a pointer directed towards a position within the color region corresponding to the selected location.

20. The graphical display of claim 18 wherein the color region has one of first and second colors corresponding with first and second detected blood flow directions.

21. The graphical display of claim of claim 18 wherein the color region has one of first and second colors corresponding with first and second detected blood flow directions, the intensity of the color varying as a function of a detected one of blood flow velocity and Doppler ultrasound signal amplitude.

22. The graphical display of claim 18 wherein the location indicator is a pointer directed towards a position within the colored region corresponding to the selected location, and wherein the colored region has one of first and second colors corresponding with first and second detected blood flow directions, the intensity of the color varying as a function of a detected one of blood flow velocity and Doppler ultrasound signal amplitude.

23. A Doppler ultrasound system for processing ultrasound signals along an ultrasound beam axis and for displaying information to a user concerning blood flow, comprising:

an ultrasound transducer operable to detect ultrasound signals and responsively produce corresponding electrical signals;

signal processing circuitry coupled with the transducer and operable to receive the electrical signals and determine blood flow characteristics corresponding with the detected ultrasound signals;

a display coupled with the signal processing circuitry and operable to provide graphical information to the user corresponding with the determined blood flow characteristics, the display providing aiming graphical information indicating a plurality of locations along the beam axis at which blood flow is detected, the display further providing spectral graphical information indicating blood flow velocities at a selected one of the locations, and the display further providing a location indicator identifying the selected location.

24. The Doppler ultrasound system of claim 23 wherein the aiming graphical information includes a color region corresponding with the locations at which blood flow is detected, the color associated with blood flow direction and having varying intensity as a function of one of detected blood flow velocity and detected Doppler ultrasound signal strength, and wherein the location indicator is a pointer directed towards a position within the colored region corresponding to the selected location.

25. The Doppler ultrasound system of claim 23 wherein the display provides the aiming and spectral graphical information simultaneously.

26. In a Doppler ultrasound system for processing ultrasound signals along an ultrasound beam axis, a method of providing information to a user concerning blood flow, comprising:

displaying first graphical information depicting blood flow at a plurality of locations along the beam axis; and

displaying second graphical information depicting blood flow velocities at a selected one of the locations, the first and second graphical information being displayed simultaneously.

27. The method of claim 26 wherein displaying the first graphical information includes displaying a location indicator directed to the selected location.

28. The method of claim 26 wherein the selected location is determined by the user.

29. The method of claim 26 wherein displaying the first graphical information includes displaying a color region corresponding with locations where blood flow is detected.

30. The method of claim 26 wherein displaying the first graphical information includes displaying color having a varying intensity in correspondence with detected Doppler ultrasound signal amplitude.

31. The method of claim 26 wherein displaying the first graphical information includes displaying one of first and second colors corresponding to blood flow in first and second directions, respectively.

32. The method of claim 26 wherein displaying the first graphical information includes displaying one of first and second colors corresponding to blood flow in first and second directions, respectively, and varying the intensity of the first and second colors in correspondence with detected blood flow velocities.

33. The method of claim 26 wherein displaying the first graphical information includes displaying one of first and second colors corresponding to blood flow in first and second directions, respectively, and varying the intensity of the first and second colors in correspondence with detected Doppler ultrasound signal amplitude.

34. The method of claim 26 wherein displaying the first graphical information includes depicting the blood flow at the plurality of locations as a function of time.

35. In a Doppler ultrasound system for processing ultrasound signals along an ultrasound beam axis, a method of detecting and characterizing emboli in blood flow, comprising:

determining a first plurality of locations along the beam axis in which blood flows and determining a second plurality of locations along the beam axis in which blood does not flow;

determining the direction in which the blood flows at each of the first locations; and

if a first ultrasound signal having an intensity greater than a threshold intensity is received, then:

determining if the first ultrasound signal corresponds with the first locations;

determining if the first ultrasound signal corresponds with the second locations;

determining if the first ultrasound signal corresponds with the determined direction and velocity of the blood flow;

if the first ultrasound signal does not correspond with the determined direction or velocity of the blood flow, then identifying the first ultrasound signal as a non-embolic signal;

if the first ultrasound signal corresponds with the determined direction or velocity of the blood flow, and if the first ultrasound signal corresponds solely with the first locations, then identifying the first ultrasound signal as an embolic signal of a first type; and

if the first ultrasound signal corresponds with the determined direction and velocity of the blood flow, and if the first ultrasound signal corresponds

both with the first and second locations, then identifying the first ultrasound signal as an embolic signal of a second type.

36. The method of claim 35, further comprising selecting one of the first locations, and wherein the first ultrasound signal is a signal corresponding with the selected location.

37. The method of claim 35 wherein determining the first plurality of locations in which blood flows includes displaying graphical information having a color region corresponding to the first locations.

38. The method of claim 35 wherein determining the first plurality of locations in which blood flows includes displaying graphical information having a color region corresponding to the first locations, and wherein determining the direction in which the blood flows at each of the first locations includes selecting one of first and second colors for the color region, the first and second colors corresponding with first and second blood flow directions along the beam axis, respectively.

39. The method of claim 35 wherein determining the first plurality of locations in which blood flows includes displaying graphical information having a color region corresponding to the first locations, and varying the intensity of the color as a function of detected Doppler ultrasound signal intensity, and wherein determining if the first ultrasound signal corresponds with the first locations includes displaying a graphical event signal corresponding with the first ultrasound signal and determining if the graphical event signal is positioned within the color region.

40. The method of claim 35 wherein determining the first plurality of locations in which blood flows includes displaying graphical information having a color region corresponding to the first locations, and varying the intensity of the color

as a function of detected Doppler ultrasound signal intensity, and wherein determining if the first ultrasound signal corresponds with the determined direction and velocity of blood flow includes displaying a graphical event signal corresponding with the first ultrasound signal and determining if the graphical event signal is positioned in a predetermined orientation relative to the color region.

41. The method of claim 35 wherein determining if the first ultrasound signal corresponds with the determined direction and velocity of blood flow includes determining if the first ultrasound signal corresponds with a velocity not exceeding a maximum velocity of the blood flow.

42. In a Doppler ultrasound system for processing ultrasound signals along an ultrasound beam axis, a method of locating a selected one of a plurality of blood vessels, comprising:

determining a plurality of locations along the beam axis in which blood flows;

displaying first graphical information depicting the locations at which blood flow is detected;

determining the velocity with which blood flows in each of the locations;

selecting a first one of the locations;

displaying second graphical information depicting blood flow velocities at the first location;

detecting a temporal variation in the first graphical information;

detecting a temporal variation in the second graphical information; and

determining whether the detected temporal variations in the first and second graphical information corresponds with the selected blood vessel.

43. The method of claim 42 wherein displaying the first graphical information includes displaying a color region corresponding with the locations at which blood flow is detected.

44. The method of claim 42 wherein displaying the first graphical information includes displaying a color region corresponding with the locations at which blood flow is detected, and varying the intensity of the color as a function of detected Doppler ultrasound signal intensity.

45. The method of claim 42 wherein displaying the first graphical information includes displaying a color region corresponding with the locations at which blood flow is detected, and varying the intensity of the color as a function of the determined blood flow velocities.

46. The method of claim 42 wherein displaying the first graphical information includes displaying a color region corresponding with the locations at which blood flow is detected, and wherein detecting a temporal variation in the first graphical information includes detecting a temporal variation in the size of the color region.

47. The method of claim 42 wherein displaying the first graphical information includes displaying a color region corresponding with the locations at which blood flow is detected, and varying the intensity of the color as a function of the determined blood flow velocities, and wherein detecting a temporal variation in the first graphical information includes detecting a temporal variation in the color intensity of the color region.

48. A computer readable medium whose contents configure a computer system to provide information to a user concerning blood flow detected by processing Doppler ultrasound signals along an ultrasound beam axis, comprising:

displaying first graphical information depicting blood flow at a plurality of locations along the beam axis; and

displaying second graphical information depicting blood flow velocities at a selected one of the locations, the first and second graphical information being displayed simultaneously.

49. The computer readable medium of claim 48 wherein displaying the first graphical information includes displaying a location indicator directed to the selected location.

50 The computer readable medium of claim 48 wherein the selected location is determined by a user of the computer system.

51. The computer readable medium of claim 48 wherein displaying the first graphical information includes displaying a color region corresponding with locations where blood flow is detected.

52. The computer readable medium of claim 48 wherein displaying the first graphical information includes displaying color having a varying intensity in correspondence with detected Doppler ultrasound signal amplitude.

53. The computer readable medium of claim 48 wherein displaying the first graphical information includes displaying one of first and second colors corresponding to blood flow in first and second directions, respectively.

54. The computer readable medium of claim 48 wherein displaying the first graphical information includes displaying one of first and second colors

corresponding to blood flow in first and second directions, respectively, and varying the intensity of the first and second colors in correspondence with detected blood flow velocities.

55. The computer readable medium of claim 48 wherein displaying the first graphical information includes displaying one of first and second colors corresponding to blood flow in first and second directions, respectively, and varying the intensity of the first and second colors in correspondence with detected Doppler ultrasound signal amplitude.

56. The computer readable medium of claim 48 wherein displaying the first graphical information includes depicting the blood flow at the plurality of locations as a function of time.